

Appendix E

International Business Machines (IBM) - San Jose Facility

Pilot Study Report

California Environmental Protection Agency
Environmental Management System Project

1.0 Pilot Description

International Business Machines (IBM) creates, develops and manufactures advanced information technologies, including computer systems, software, networking systems, storage devices, and microelectronics. The company employs close to 290,000 people in over 150 nations. The pilot project participant is the San Jose Storage Technology Division site, which employs approximately 8,000 workers who develop, manufacture, and market storage components and systems. Manufactured products include thin film magnetic recording heads, thin film storage disks, and disk drive systems.

Pilot Project Management

IBM was selected as a pilot in June 2000. The Cal/EPA Project Manager is Richard Corey, Chief, Research and Economic Studies Branch, Research Division, Air Resources Board. Mr. Corey was assisted by Jean Woeckener, Air Pollution Specialist, Stationary Source Division, Air Resources Board. For the purpose of this project, the contacts at IBM have been Elizabeth Zimmermann, Advisory Engineer, and Jim Dumanowski, Manager, Environmental Programs.

History of Environmental Management at IBM

IBM has a long history of adopting measures to improve its environmental performance. As early as 1971, IBM did pollution prevention planning and waste minimization planning. In 1972, the company established a corporate EMS. This began an evolution of environmental management related activities at IBM that eventually led to worldwide IBM certification to the ISO 14001 EMS standard.

In 1978, IBM San Jose initiated a groundwater protection program as part of a corporate wide review of IBM's EMS. In the ensuing investigation, soil and groundwater were sampled both within and outside the boundaries of the San Jose site. Chemicals were detected in soil and groundwater onsite and in groundwater offsite. As a result of these findings, extensive prevention and remediation programs were carried out. During this same timeframe, the potential impacts of underground storage were becoming better understood. In response, environmental professionals in Santa Clara County developed a model Hazardous Materials Storage Ordinance, which was subsequently adapted and adopted nationwide. IBM personnel played an integral role in this effort.

Beginning in the early 1980's, IBM began preparing a corporate-wide annual environmental report for internal use and established a procedure for receiving and responding to communications from external interested parties.

Before its ISO registration and its participation in this pilot project, IBM was participating with local government to evaluate pollution prevention and waste minimization strategies. For example, in 1995/96 IBM worked with the City of San Jose to evaluate wastewater processing at IBM's facility with a goal to identify innovative and technologically feasible methods of reducing the mass and/or concentration of nickel in wastewater discharged by IBM's facility to the water pollution control plant.

In 1992, the San Jose facility became certified to ISO 9001. In June 1997, as part of IBM's program to register all of its manufacturing and development sites worldwide, the San Jose Storage Technology Division site became the first IBM facility in the U.S. registered to ISO 14001.

A unique characteristic of IBM's registration is that the company holds a single global registration. IBM's decision to have all its facilities ISO 14001 certified under one registration reflects its corporate policy. It ensures international consistency, promotes efficient and effective business processes, and validates IBM's commitment to establish fundamentally consistent EMSs no matter where in the world it does business.

2.0 Project Objectives

Because IBM was certified to ISO 14001 in 1997, prior to this project, it is considered a mature EMS for analysis purposes. The IBM project afforded the opportunity for production of a performance data set for a complex facility in a highly competitive business sector

The pilot project with San Diego was conducted in order to meet the following objectives specified in AB 1102 (Stats. 1999, Ch. 65) codified in Public Resources Code, Section 71045 et seq.

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| Objective 1 | Whether and how the use of an environmental management system (EMS) by a regulated entity increases public health and environmental protection over their current regulatory requirements ¹ ; and |
| Objective 2 | Whether and how the use of an EMS provides the public greater information on the nature and extent of public health |

¹ Protection provided by current regulatory requirements is defined as those protections provided through the issuance, enforcement, and monitoring of any permit, requirement, authorization, standard, certification, or other approval issued by a federal, state, regional or local agency to the regulated entity for the protection of the public health or the environment (PRC § 71046(a)(1)).

and environmental effects than information provided by their current regulatory requirements².

To the above, the Cal/EPA added the following objectives:

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| Objective 3 | Evaluate economic indicators to determine incentives and barriers to EMS implementation |
| Objective 4 | Identify challenges and successful examples of EMS implementation |

Further, each pilot candidate had one or more additional pilot specific objectives. The pilot specific objectives for IBM included the following.

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| Objective 5 | Determine if and how IBM's EMS affects customers and suppliers |
| Objective 6 | Determine if and how IBM uses progress towards targets to continually improve the environment |
| Objective 7 | Determine if IBM's EMS leads to greater employee awareness of its impact on the environment as well as the likelihood that adjustments will be made to reduce its impact. |

In the following sections, each objective will be paraphrased. For example, Objective 1 is referred to as simply environmental protection. The term environmental protection is intended to capture protection of both environmental and public health.

3.0 Project Methodology

IBM has contributed data consistent with the National Database and the California Protocols. The data submitted was for the baseline years 1994, 1995, and 1996 as well as the update data for 1997 and 2000.

The analysis was accomplished by evaluating changes in environmental protection and changes in the environmental information made available to the public as a result of EMS implementation at IBM.

A complicating factor in data evaluation is the evolution of IBM's EMS over three decades. Although ISO 14001 certification was granted in 1997, many of the EMS

² Information provided by current regulatory requirements is defined as that information provided through the issuance, enforcement, and monitoring of any permit, requirement, authorization, standard, certification, or other approval issued by a federal, state, regional or local agency to the regulated entity for the protection of the public health or the environment, or any other law or regulation governing the disclosure of public information (PRC § 71046(a)(2)).

elements were already in place. Therefore, there is no 'bright line' for EMS implementation thus creating difficulties in comparing pre versus post EMS environmental conditions given the study period. The analysis will therefore evaluate and emphasize improvements in environmental protection over regulatory standards, as a result of a systematic approach to environmental management. Further, any clear benefits from ISO 14001 certification will be highlighted.

3.1 Objective 1 Environmental Protection

To determine whether and how improved environmental protection resulted from EMS implementation, the following three primary categories of information were evaluated.

1. Awareness and commitment
2. Systematic management of environmental impacts
3. Environmental performance indicators

Awareness and Commitment refers to the scope of environmental issues to which the organization devotes its attention, and identifies increased knowledge and understanding of environmental impacts, as well as recognition that action is necessary to lessen impacts and improve environmental protection.

Staff reviewed and analyzed the following measures of Awareness and Commitment:

1. The presence of an environmental policy which describes the organization's commitments and principles in regards to environmental protection.
2. Demonstrated knowledge and understanding of environmental laws, regulations, and other requirements.
3. Demonstrated knowledge and understanding of the environmental impacts of the organization.
4. Documentation of objectives and targets for environmental protection improvements.

Systematic management of environmental impacts refers to the ability of an organization to better protect the environment through a more mature and effective system of environmental management.

Staff reviewed and analyzed the following measures of systematic management for environmental protection:

1. Documented implementation strategies and responsibilities designed to meet regulatory requirements, manage significant aspects, and achieve objectives and targets for improved environmental protection.
2. Measures to assess environmental performance.
3. Audit and review processes to assess the performance of the management system and make system adjustments in order to continually improve environmental performance and protection.

Environmental performance indicators are the most quantitative and direct way of measuring changes in environmental protection. Key environmental indicators are the direct performance measure of an EMS. Examples include energy use, water use, solid and hazardous waste reduction, air emission, and quality of water discharge. An analysis of key environmental indicators provides information as to whether an EMS improves environmental protection.

Project staff reviewed and analyzed environmental data in the following areas to determine whether the EMS improved environmental protection.

1. Progress towards objectives and targets
2. Pre and Post EMS Environmental Performance
3. Performance Beyond Regulatory Requirements
4. Compliance Performance

3.2 Objective 2 Environmental Information

Staff analyzed the following two factors to determine whether and how an EMS provides greater environmental information to the public was accomplished.

1. The level of public and stakeholder involvement into the EMS development, implementation, and review; and
2. The level of improvements in the accessibility and quality of environmental information available to the public as a result of EMS implementation.

The level of public and stakeholder involvement into EMS development, implementation and review not only indicates changes in communication, it also indicates a changing stakeholder role in improving environmental protection. Involvement provides avenues for stakeholder response to environmental information and feedback to the organization on their performance. This indicator of greater environmental information is measured by evaluating actual stakeholder participation in the pilot's EMS and processes in the EMS for outside communication. This information was collected through the National Database, California Protocol and through Cal/EPA Project Manager's observations.

Improvements in the accessibility and quality of environmental information were evaluated using the California Protocols. Improvements in compliance with legal reporting requirements and information sharing beyond legal requirements indicate improved communication to the public. Accessibility and quality (timeliness, relevance, completeness, and credibility) is evaluated to determine whether the EMS results in greater information available to the public.

3.3 Objective 3 Economic Incentives and Barriers to EMS Implementation

Economic data was not provided by the pilot project, and therefore, this analysis is not included in the case study report.

3.4 Objective 4 Successes and Challenges of EMS Implementation

In order to catalogue many of the lessons learned from IBM's EMS experience, challenges and successes will be identified through the Cal/EPA Project Manager's observations, interviews with IBM's personnel, and data analysis. Understanding these challenges and successes will help answer how an EMS may impact environmental protection.

3.5 Objective 5 Determine if and how IBM's EMS affects customers and suppliers

By evaluating elements of IBM's EMS, such as its Environmental Policy, aspects, objectives and targets, and implementation programs, an understanding of how its EMS directs action towards customers and suppliers, and thus affects environmental protection outside of its company is gained.

3.6 Objective 6 Determine if and how IBM uses progress towards targets to continually improve environmental protection

Understanding how progress towards targets provides continual improvement in environmental protection is expected to be achieved through evaluating how targets are set, reviewed, and responded to by management. Other mechanisms for continual improvement will also be highlighted.

3.7 Objective 7 Determine if IBM's EMS leads to greater employee awareness of their impact on the environment as well as the likelihood that they will make adjustments to reduce their impact.

By evaluating methods and effectiveness of internal communication, training, and other programs of IBM's EMS, a determination of the effect of EMS implementation on employee awareness behavior will be attempted. Any measures of employee awareness or behavior will be highlighted.

4.0 Discussion and Analysis

4.1 Objective 1 Environmental Protection

Awareness and Commitment

Environmental Policy

IBM's environmental policy was issued in 1997 and signed by Louis V. Gerstner Jr., Chairman and Chief Executive Officer. IBM has had longstanding corporate policies of providing a safe and healthful workplace, protecting the environment and conserving

energy and natural resources, which were formalized in 1967, 1971, and 1974 respectively.

The first three commitments in IBM's Environmental Policy help define the policy's scope and expressly state IBM's responsibility to affected stakeholders (employees, neighbors, and authorities). The scope includes the environment, health and safety of both employees and neighbors. IBM commits itself to provide for a safe and healthful workplace and be an environmentally responsible neighbor. Incidents will be reported to authorities promptly and affected parties will be informed as appropriate. These items are important in defining the quality of the relationship between IBM and its community of workers, neighbors and agencies.

The contents of the policy are as follows:

1. Provide for a safe and healthful workplace and ensure that personnel are properly trained;
2. Be an environmentally responsible neighbor and act promptly to correct incidents that endanger health, safety, or the environment; and
3. Report incidents to authorities promptly and inform affected parties as appropriate.

Commitments to environmental protection that go beyond legal requirements are expressed in the next four bullet points. These points demonstrate commitments to applying pollution prevention and resource conservation in the development, manufacturing, and use of IBM products. These also demonstrate awareness that the environmental aspects of its products are not limited to the manufacturing process but include development and use of its products.

4. Conserve natural resources by reusing and recycling materials, and purchasing recycled materials;
5. Develop, manufacture, and market products that are safe for their intended use, efficient in their use of energy, protective of the environment, and that can be reused, recycled or disposed of safely;
6. Use development and manufacturing processes that do not adversely affect the environment, including developing and improving operations and technologies to minimize waste, prevent air, water, and other pollution, and minimize health and safety risks, and dispose of waste safely and responsibly; and
7. Ensure the responsible use of energy throughout our business, including conserving energy, improving energy efficiency, and giving preference to renewable over nonrenewable energy sources when feasible.

Additional policy objectives relate to IBM's efforts to be a leader in the protection of the environment worldwide. These commitments reflect the global scale of IBM's single ISO 14001 registration and a commitment to meeting high environmental standards in a world of varying requirements.

8. Participate in efforts to improve environmental protection and understanding around the world and share appropriate pollution prevention technology, knowledge and methods;
9. Utilize IBM products, services and expertise around the world to assist in the development of solutions to environmental problems;
10. Meet or exceed all applicable government requirements and voluntary requirements to which IBM subscribes. Set and adhere to stringent requirements of our own no matter where in the world the company does business;

The final two bullets commit IBM to a process of continual improvement and reporting progress to the general public and the Board of Directors.

11. Strive to continually improve IBM's environmental management system and performance, and periodically issue progress reports to the general public; and
12. Conduct rigorous audits and self-assessments of IBM's compliance with this policy, measure progress of IBM's environmental affairs performance, and report periodically to the Board of Directors.

Every employee and every contractor on IBM premises is expected to follow this policy and to report any environmental, health, or safety concerns to IBM management. Managers are expected to take prompt action.

IBM's policy expresses a commitment to the protection of its employees, the communities in which they work and the global environment. IBM's decision to have all of its facilities ISO 14001 certified under one registration is reflected in this corporate policy. The policy demonstrates an awareness and commitment to environmental protection that goes well beyond the requirements of law and regulation.

Knowledge and Understanding of Legal Requirements

As a result of certifying its EMS to ISO 14001, IBM formalized its existing process for identifying applicable legal requirements. IBM assigns responsibility for coordinating this process to a single individual at the facility. The compliance assurance program owner reviews available resources on an ongoing basis for potential new/revised requirements (e.g., the Federal Register, California Regulatory Notice Register, communications from agencies, e-mails from trade organizations/lobbyists, and letters from local government). Information that is determined to be of interest is assigned to subject matter experts for detailed review, assessment of potential impact to IBM, and

development of an action plan for response, as appropriate. Such assignments, and any resultant action plans are tracked through to closure. No new legal requirements were identified as a result of formalization of this process in order to register to the ISO 14001 standard.

Knowledge and Understanding of Environmental Impacts

An environmental aspect is an element of an organization's activities, products, or services that can interact with the environment. Significant aspects and impacts are determined by the organization based on a self-established standard methodology. Management of all significant aspects is required by ISO 14001. Significant aspects are therefore a good indicator of awareness and commitment. Table 1 lists all significant aspects and impacts for IBM.

In addition to listing significant aspects and impacts, Table 1 also shows whether each aspect relates to regulated or non-regulated impacts. IBM reported 12 significant aspects: energy use, solid waste, water use, employee transportation, products, water discharges, hazardous/regulated waste discharges, unplanned releases, air emissions, chemical use, groundwater/soil cleanup, and hazardous materials transportation. Five of these aspects and impacts (energy use, solid waste, water use, employee transportation, and products) are non-regulated.

These aspects and impacts were developed by a group of internal environmental experts and others who relied on conditions and regulatory constraints at the site. Four primary factors were qualitatively considered in making this determination:

- The environmental impact of the aspect
- Legal/regulatory requirements
- Corporate environmental requirements
- The facility's and corporation's commitment to be a responsible neighbor

The selection of five non-regulated aspects and impacts as significant demonstrates IBM's commitment to go beyond what is legally required to be a good environmental neighbor.

Objectives and Targets

Objectives and targets are listed on Table 2. The status of the objectives and targets or the pilot's progress towards these goals is discussed later in Section 4.1.3 Environmental Performance Indicators.

Table 2 lists objectives and targets for IBM. The objectives are to reduce power consumption, reduce waste generation, reuse materials where possible, recycle materials, purchase recycled items, efficiently use water, reduce hazardous waste

generation, and conform to the ISO 14001 standard. The target for each objective uses 1997 as the baseline year (i.e., reduce power consumption by 4% of 1997 usage).

The objectives and targets listed by IBM are all non-regulated impacts. Objectives and targets were set by evaluating the legal/regulatory and corporate requirements for the specific significant aspect. If the environmental program associated with the aspects was determined to be in compliance with these requirements and there was minimal additional benefit to be gained by additional effort, the aspect was determined to be in operational control and no objective or target was established. An example would be air emissions, where the site has identified all air emission sources, obtained required permits, operates within permit limits and abates emissions to meet or exceed the requirements.

Additionally, objectives and targets were developed for aspects that were identified as under control but which were determined to be of significant local concern. Employee transportation and water use are examples.

The non-regulatory nature of IBM's objectives and targets indicate an awareness of environmental impacts that can be summarized in two points. First, a belief that regulated aspects are under control and additional benefits are limited. Second, that progress in environmental protection lies outside of the regulatory arena.

Systematic Management for Environmental Protection

This section describes the actions taken by the organization that relate to the implementation and review of the EMS and document how the organization protects the environment through its operations.

Documented Implementation Strategies and Responsibilities

IBM's Documented Implementation Strategies and Responsibilities include the following.

- Operational Controls
- Training Programs
- Emergency Preparedness
- Compliance Assurance
- Employee Involvement and Communication
- Pollution Prevention Programs
- Supply Chain/Environmentally Preferred Purchasing
- Performance Tracking
- Audit and Review

Operational Controls

To assist in the maintenance of an effective EMS, IBM San Jose identified operations and activities associated with legal requirements and/or their identified significant environmental aspects. For these operations and activities, IBM established and maintains procedures to cover situations where their absence could lead to deviations from legal requirements. The procedures address IBM's environmental policy, environmental corporate instructions, practices and standards, and the location's objectives and targets. All operations and activities, including maintenance, are to be carried out as specified in the procedures, including any specified operating criteria.

All IBM San Jose vendors and contractors receive a copy of the facility's Contractor Guide, which summarizes site policy, practices and instructions that the contractor must be aware of when working at the site and provides the framework for operational control of their activities. Operational control procedures related to the significant environmental aspect of goods and services from suppliers are established through policies established, maintained and implemented at the corporate level.

Through the use of operational controls IBM ensures that activities with legal requirements or significant impacts are managed appropriately. IBM believes that its EMS has helped it to establish a formal mechanism for updating its procedures for operations and activities.

Training Programs

Prior to implementation of the ISO 14001 EMS, facility employees were made aware of their potential impact on the environment through training associated with their respective job responsibilities. While not specifically identified as EMS responsibilities, the on-the-job and classroom training provided the information on conformance to legal, regulatory and corporate environmental requirements. Personnel were instructed, for example, in (1) how to properly store and handle chemicals so as to prevent releases to the environment; (2) how to properly label and manage hazardous waste containers; (3) how to monitor chemical use in manufacturing tooling to meet air emission permit requirements; and (4) how to operate the wastewater treatment facility such that discharges met permit requirements.

Following implementation of the ISO 14001 EMS, employees continue to receive the same type of training. In addition, they receive annual ISO 14001 EMS awareness training. The awareness training ties the job responsibility training more directly to the site EMS. Both management and non-management employees who are responsible for the development and implementation of specific environmental programs have measures related to compliance with legal/regulatory, corporate environmental requirements, and environmental performance directly tied to their annual employee performance reviews.

To evaluate the effectiveness of the training programs, each staff person who is responsible for an environmental program which is associated with an aspect, monitors the performance of key elements of their program. Indication that performance is outside of acceptable limits is investigated and corrected. This includes indications that training may be the root cause of the problem and determination that retraining or additional training is needed. Additionally, internal audits are designed to assess employee understanding of the basic concepts of the EMS such as their awareness of the facility's environmental policy and the actions that they specifically implement to help achieve relevant facility objectives and targets.

The EMS has added two key elements to IBM's training program. First the EMS has helped link job performance with a written environmental policy as well as the potential environmental consequences of not performing job duties appropriately. Second, measuring training effectiveness is integrated with the audit, review and corrective action processes. In this way, training is part of IBM's continual improvement cycle.

Emergency Preparedness

One of IBM's environmental policy statements specifies that IBM is "to act promptly and responsibly to correct incidents or conditions that endanger health, safety, or the environment." Key to meeting this objective are effective emergency preparedness and response procedures related to environmental protection. Each site establishes documented procedures, appropriate to their operations and activities, which identify the potential for and response to accidents and emergency situations having the potential for environmental impacts, including preventing and mitigating the environmental impacts associated with such accidents and emergency situations, as appropriate for the magnitude of the environmental impact. Managers are responsible for ensuring that their employees are knowledgeable of emergency actions applicable to their jobs and for ensuring that employees are properly trained.

At the San Jose facility site, security is responsible for developing and implementing programs for site-wide emergency preparedness and response. Primarily designed to address employee and plant safety, elements of the Site Emergency Response Plan for Site Security are utilized in the event of a major site environmental incident.

The Site Emergency Response Plan includes the following programs:

- Maintains various procedures specifically for planning and response to environmental incidents
- Tests its chemical incident procedures and continues to do so where and when practicable
- Works with appropriate site organizations to install and maintain devices to detect and provide notification to site personnel in the event of a release, providing an opportunity to mitigate releases before they can adversely impact the environment

- Established and maintains a process for reviewing chemical releases and other environmental incidents to:
 - Assess their cause
 - Assess corrective action
 - Assess preventive action, as appropriate
 - Ensure that all legal and other reporting requirements have been met
 - Permit the review and revision, as necessary, of emergency preparedness and response procedures following an environmental incident

Emergency preparedness plans required by regulations (e.g., Hazardous Materials Business Plan documents, Spill Prevention Countermeasure and Control, and Contingency Plan) for hazardous waste permits are integrated into the EMS as part of routine site operations. The EMS document control process helps assure that these documents are controlled and reviewed, updated, and that changes are made known to affected personnel in a timely manner.

The San Jose site uses both quantitative and qualitative processes to measure emergency preparedness improvements. Quantitatively, measurements include number of incidents, volume of any releases that may occur, the time to respond to incidents, and the number of incident reports provided to regulatory agencies. Qualitatively, an Environmental Incident Review Board, chaired by the Site Operations Manager, reviews all incidents and evaluates how well the incident was responded to and how effective corrective actions were for the incident.

IBM corporate and local requirements related to emergency preparedness and response are more stringent than regulatory requirements, particularly in the areas of planning, internal reporting and tracking, and continual program improvement. Specifically, IBM sites worldwide use the company's Environmental Incident Reporting System (EIRS) to report to IBM management on accidental releases and incidents of noncompliance. Each incident that meets IBM's environmental incident reporting criteria which equal or surpass regulatory reporting requirements must be reported through EIRS. Each IBM location must also have a documented incident prevention program, including provisions for preventing environmental incidents or their recurrence, and reporting procedures.

Also, although not required by regulation, the EMS has resulted in the San Jose site reinstituting its program to annually test its emergency response process. These tests assist in the overall training of personnel responsible for responding to environmental incidents and provide input to the evaluation of the effectiveness of the overall incident preparedness program.

By incorporating its emergency preparedness program into the EMS, IBM believes it has been able to increase employee and management awareness of the program, its

importance, and their role in its successful implementation. The incorporation has also formalized review, document control, and continual improvement of the program.

Compliance Assurance

The San Jose facility utilizes internal assessments of environmental programs to help assure compliance with legal, regulatory, and corporate requirements. These assessments are conducted at various frequencies during the year based on specific criteria (e.g., amount of activity, potential exposures). Facility personnel who are responsible for environmental program implementation and maintenance also review their respective programs using checklists, facility inspections, and records.

Should a violation or nonconformance be identified, a process of corrective action and root cause analysis is done to determine the sources and causes of the problem so that it may be immediately corrected.

Compliance with applicable legislation, regulations, permits, licenses, and other requirements is reviewed on an ongoing basis as monitoring and measurement data are collected and reported. Any deviations are addressed in a timely fashion and in a manner appropriate to the magnitude of the environmental impact (as determined by the site Environmental Programs Manager or appropriate management or staff). Permit exceedences are reported to corporate Environmental Affairs in the annual Environmental Master Plan. In addition, the facility uses several tools to assess, at least annually, compliance with applicable requirements. These include:

- Environmental Programs Semi-Annual Self-Assessment Program and its successor, the annual Professional Self-Assessment program (internal IBM protocol)
- Environmental Self-Assessment Program and its successor program, eAudit (internal IBM protocol).

The facility also used Peer Audits performed by environmental personnel from other organizational locations, focus audits performed by staff from other divisions, and Corporate Business Controls Audits to verify self-assessments and further document compliance with environmental requirements. Additionally, routine field audits are conducted to help assure both the organization and contractor personnel are in conformance with the requirements of the EMS.

IBM's compliance assurance system has evolved over many years and is now integrated in the company's EMS. IBM's program uses system protocols such as audits, reporting, management review and corrective action to continually improve its compliance program.

Employee Involvement and Communication

IBM San Jose shares information on aspects and impacts and related objectives and targets annually through its employee awareness training package. On a quarterly basis, information is shared with employees related to performance toward targets and opportunities for participation in programs related to aspects and impacts for areas all site employees have an influence on, such as water and energy conservation, recycling, and alternative commute opportunities.

As IBM's EMS was modified to meet the requirements of the ISO 14001 standard, and information was made available on aspects, impacts, and related information to site personnel. As a result, IBM has indicated that improvement was noted in the awareness which site personnel had of site environmental requirements program and performance. This begins the process of integrating ownership of environmental performance into the day-to-day business practices of all site employees.

Information at the IBM San Jose facility is shared with employees in several ways including the annual EMS employee awareness training package; the site Bulletin Board system; the San Jose Environmental Programs internal web page; and periodic employee awareness events such as Earth Day, information fairs and other outreach events.

Pollution Prevention Programs

IBM has maintained an EMS in one form or another for over 25 years. Pollution prevention has been an element of its activities for decades and therefore did not change as a result of establishing a formal EMS. However, the ISO 14001 EMS did provide additional structure and increased awareness of existing ongoing pollution prevention activities.

The IBM San Jose site does share pollution prevention techniques and benefits through participation and presentations at technical conferences, participation in pollutant or industry specific focus groups coordinated by local regulatory agencies. IBM is also active in various trade associations and has been the recipient of several local environmental awards.

Supply Chain/Environmentally Preferred Purchasing

IBM is committed to doing business with environmentally responsible companies when ever it contracts for services and suppliers. Corporate instructions prevent the transfer of responsibility for environmentally sensitive operations to companies that lack either the commitment or capability to manage them properly.

IBM has thousands of supply agreements around the world with vendors, subcontractors and suppliers. Work covered under these agreements includes everything from off-the-shelf commodities and consulting services to manufacturing and assembly operations and equipment maintenance. By contract, these suppliers must comply with all applicable laws and regulations in performing their work for IBM.

Through substantive environmental evaluations, IBM also focuses on environmental responsibility for a certain subset of its suppliers. Although it is neither feasible nor appropriate for IBM to evaluate all of its thousands of suppliers, the company does so for certain production-related suppliers, based upon the degree of environmental risk inherent in their operations and the extent to which their work is unique to IBM. The objective of these evaluations is to assess whether the suppliers have a good focus on environmental management, including complying with laws and regulations and sound management practices.

As an example, IBM evaluates all of its hazardous waste disposal vendors, their facilities and treatment methods, prior to approving them for use - except in those few countries where the government designates the approved supplier of such services. Vendors are periodically reevaluated in order to verify that their environmental operations remain satisfactory. Product disposal vendors, even though IBM does much of this activity in-house, are also evaluated in the same manner.

Any relevant concern that may arise during evaluations is addressed with the vendor or supplier and must be resolved to IBM's satisfaction.

IBM shares appropriate technology and expertise with many of its suppliers. This not only ensures that its products are produced in an environmentally responsible manner, but also assists suppliers in improving their own environmental performance.

Performance Tracking

The San Jose facility measures the performance against established objectives and targets in various ways, depending on the specific objectives and targets. Progress towards achieving the facility's established targets is reviewed periodically. This review is either done monthly, quarterly, or at some other frequency established by the facility personnel who are responsible for meeting those objectives and targets. These reviews may take the form of a report to Corporate Environmental Affairs, site management, or review by other responsible personnel. Whichever mechanism is used, the individual responsible for achieving the target is also responsible for ensuring that the target is met within the identified time frame.

Audit and Review

To assess the overall effectiveness of IBM's EMS and to identify opportunities for continual improvement, the San Jose site employees monitor and measure key characteristics of the site's activities and operations that can have a significant impact on the environment. Key characteristics are defined at San Jose to include operating conditions or parameters in the following categories:

- Parameters directly associated with a regulatory permit condition or discharge limit

- Parameters associated with the measurement of critical elements of the established objectives and target
- Critical parameters associated with site significant environmental aspects

Environmental Performance Indicators

The actual environmental performance of the pilot project during the study period is described below.

Progress Towards Objective and Targets, Table 2

Table 2 lists objectives and targets for IBM (post-baseline years of 1994, 1995, 1996) as well as the status and whether the target was regulated or non-regulated. During the reporting period IBM met four of its targets.

- Reduce power consumption by 4% using 1997 as the baseline year
- Efficient water use by generating trend charts using 1997 as the baseline year
- Reduce hazardous waste generation again using 1997 as the baseline
- Conform to ISO 14001 standard which they achieved by becoming registered in 1997

While the company did not achieve the targets they set for the other objectives, Table 3 generally shows a steady decline in water use and hazardous waste disposal.

Pre and Post-EMS Environmental Performance, Table 3

Table 3 lists environmental performance indicators for the baseline years 1994, 1995, and 1996. Post-certification years 1997 and 2000 are also shown. This data was collected using University of North Carolina database.

The table indicates that for the post-EMS years, 1997 and 2000, there were decreases in most of the indicators relative to the baseline.

The following information was provided by IBM to explain some of the fluctuations in indicators during the baseline years:

- Solid waste recycle rates decreased due to a change in mission for the facility. The primary component of the solid waste recycle program has been metals recovery. Metal for recycling has come from a variety of sources, primarily from the teardown of products returned from customers who have leased the equipment or from internal company users of facility products. Metals also come from facility rearrangement processes (e.g., removal of air handling ductwork, manufacturing equipment, etc.). During the baseline period covered by this

report, the site mission to receive and teardown returned product changed in that a much smaller amount of metal is now being handled at the facility

- Toxic Release Inventory (TRI) emissions increased due to two factors. First, prior to 1995, emissions of N-methyl-2-pyrrolidone (NMP) were not required to be reported under the TRI requirements. Second, production increased significantly between 1994 and 1996 which caused an increase in the use of both ethylene glycol and NMP
- The changes experienced between 1994 and 2000 in hazardous waste disposal, waste water discharge, and water use are all directly related to changes in (1) the number and complexity of process steps conducted for the products manufactured at the facility, (2) fluctuations in the volumes of products produced at the facility, and (3) the exact mix of manufacturing steps performed at the facility.

Performance Beyond Regulatory Requirements, Table 4

This table is designed to show how the facility performs against their permitted emissions. IBM reports that they are at or below permitted levels and therefore they have not set targets and objectives to meet regulatory requirements. Because IBM has many permitted sources that emit Nitrogen Oxide (NO_x), Sulfur Oxide (SO_x), Carbon Monoxide (CO), particulates, and VOCs, these numbers are shown in aggregate.

Compliance Performance, Table 5

Table 5 provides compliance information for the years 1994, 1995, 1996, 1997, and 2000. During this period IBM had three minor violations and two noncompliances. There were no fines associated with the minor violations.

The company has reported that the first minor violation in 1996 was caused when site vendor personnel responsible for accompanying the City Waste Treatment Plant inspector took a sample using a pump which was contaminated. To prevent this from happening again, IBM secured a dedicated sampling pump and detailed written sampling procedures were established. All vendor personnel responsible for this sampling were trained to assure they were aware of proper sampling collection and handling procedures.

The second minor violation in 1996 occurred when three samples of site drinking water tested positive for coliform bacteria which exceeded the monthly total coliform Maximum Contaminant Level (MCL). For public water systems which collect fewer than 40 samples per month, more than one sample collected during any month which is positive for total coliform is a MCL exceedence. After the minor violation, a review of the site water system was completed and nothing was identified that could have potentially affected the coliform tests. Resampling was done of the site storage tank, original sampling points, upstream and downstream sample points and no coliform was

detected in the samples. It was concluded that the positive coliform results were from sampling or laboratory contamination.

The 1994 noncompliance occurred during a routine inspection when the inspector identified drums of waste which contained activated alumina desiccant. The drums had not been labeled as hazardous waste as the contents were being analyzed to determine whether or not they would require management as hazardous waste. The site Operation Plan, which is part of the approved facility Resource Conservation and Recovery Act (RCRA) Permit, states that the facility would manage all chemical wastes as hazardous wastes, whether or not they were in fact hazardous.

The analytical data confirmed that the activated alumina desiccant was not hazardous waste by either Federal or State definition and the waste was disposed of accordingly.

To prevent this from recurring, the Operations Plan was modified to clarify that all chemical wastes are not automatically handled as hazardous waste. Rather, appropriate classification or analysis is conducted prior to final waste determination and subsequent appropriate disposal.

The last noncompliance issued in 1996 was for three minor issues that were raised as a result of a routine RCRA inspection. The noncompliances were: 1) an eyewash was being inappropriately used. Vendor personnel removed the eyewash head and a hose was connected in its place; 2) an out-of-state waste storage tank had not undergone timely formal notification to the State of facility closure; and 3) completed copies of out-of-state manifests had not been returned to the State in a timely manner.

To prevent these noncompliances from recurring, the eyewash was immediately returned to its proper operating condition. Investigation identified that the hose had been connected earlier in the day. Training was provided to vendor personnel regarding use of appropriate hose connections for needed water supply. For the last two issues, the appropriate paperwork for facility closure was filed with the State and closure was completed. Additional tracking of closure process timing was initiated.

The minor violation in 2000 occurred when a temporary discharge of hydrochloric acid caused an exceedance of the facility's permitted waste discharge limit for pH. The discharge occurred during testing of a new deionized (D.I.) water reverse osmosis system. The pH of the wastewater at the outfall to the sanitary sewer decreased to below the lower discharge limit of 6.5. This was due to a fault in the acid injection system, which allowed acid to siphon into the product water discharge line when the acid pump was shut off. The system was upgraded to prevent a reoccurrence with the installation of a solenoid valve and by re-directing the initial discharge to the facility's onsite industrial wastewater treatment facility. There has been no repeat incidence of this type of discharge.

4.2 Objective 2 Environmental Information

Public and Stakeholder Involvement in EMS Development, Implementation and Review

Cal/EPA established stakeholder Working Groups in both Southern and Northern California. Participation in one of those working groups was a requirement of inclusion into the pilot project. Working Groups were established to enlist stakeholder involvement and advice in meeting the objectives of the Cal/EPA pilot project as well as to provide a forum for stakeholder input into the pilot's EMS. Although pilot project participation with stakeholders through the Working Group was a project requirement, the experience of IBM in this setting can provide information as to the willingness of parties to work together as well as the value of that relationship. IBM participated on the Northern California Working Group and hosted an on-site meeting and facility tour on September 19, 2000.

It is important to remember that IBM had an EMS for many years and was certified to the ISO 14001 standard before it became a pilot project. Because of this, there was not public involvement in the EMS development, implementation and review. However, the facility did participate as an active member of the pilot project completing the protocols, attending Working Group meetings, and hosting on site meetings and tours.

Improvements in Public Accessibility and Quality of Information, Table 6

Table 6 identified what environmental information is available and where it can be found. All of the information provided by IBM is given in corporate-wide terms and not by individual facility. Much of the information that is given is not legally required to be disclosed. That information includes the corporate environmental aspects, impacts, objectives and targets, and operation and procedures. Resource use such as energy, water, and materials is also given.

Information on IBM's operations can be found on their web site or can be obtained in hard copy.

4.3 Objective 3 Economic Incentives and Barriers to EMS Implementation

Economic indicators were not available from the pilot project; therefore, an analysis of economic costs and benefits of EMS implementation is not included.

IBM has stated that costs are not the primary measure used to assess the effectiveness of the corporate EMS. The corporate EMS has been established for many years and the primary measure of EMS effectiveness is quantifiable results seen in improved environmental performance indicators and qualitative improvements noted as a result of the ISO 14001 EMS (e.g., improved employee awareness of the Environmental Policy, environmental aspects and the overall EMS, improved procedures, controlled procedure changes, improved operational control, improved training). Costs of individual projects implemented as part of desired environmental improvements are tracked project-by-project. Qualitative benefits of maintaining the EMS are tracked by internal/peer audit

results. Quantitative improvements to environmental performance are tracked as part of measurement of performance against established objectives and targets.

4.4 Objective 4 Successes and Challenges of EMS Implementation

A challenge identified by IBM in establishing its ISO 14001 EMS was assuring that processes required for maintenance of the EMS registration were designed with minimal complexity to assure efficient implementation. These included document control and internal auditing programs

While IBM had a mature EMS when this pilot study began and had the advantage of utilizing the structure and processes of its existing ISO 9000 registration to bring the San Jose facility into alignment with the ISO 14001 requirements, there were still some challenges. For example, IBM had a Corporate Environmental Policy, site environmental priorities, Environmental Management Department, process controls in some areas, legally required training, record retention system, and compliance audits. But they did not have a systematic method of setting targets to decrease significant impacts and to increase savings, a method to identify significant environmental aspects which require written operational procedures, documented control system for environmental procedures and records, a systematic audit of EMS effectiveness, audit closure and continuous improvement, a formal schedule for emergency drills, and documented action items and closure from management reviews.

4.5 Objectives 5 Determine if and how IBM's EMS affects customers and suppliers

During the existence of the San Jose facility's EMS, it has provided EMS-related technical support and training to (as well as imposing restrictions on) its customers as well as suppliers. An example of this is the elimination of the use of chlorinated flourohydrocarbons (CFCs) in the manufacture of the facility's products. Alternative manufacturing technologies developed by the facility were shared with customers, suppliers, and competitors through training sessions and other forms of interaction. Restrictions on the use of CFCs were also placed on facility suppliers. The facility also conducts EMS-related audits of both its supplier facilities and the activities performed by these suppliers.

Product design standards, as applicable, are also provided to suppliers to help assure that facility products are designed and manufactured so that they incorporate relevant environmental considerations. Similarly, the facility's ISO 14001 EMS has helped assure its customers that the facility establishes and meets the highest standards of environmental care.

Two of IBM's Environmental Policy objectives are to: 1) develop, manufacture, and market products that are safe for their intended use, efficient in their use of energy, protective of the environment, and that can be reused, recycled or disposed of safely; and 2) use development and manufacturing processes that do not adversely affect the environment, including developing and improving operations and technologies to

minimize waste, prevent air, water, and other pollution, minimize health and safety risks, and dispose of waste safely and responsibly. IBM helps to ensure that these objectives are met by their suppliers through substantive environmental evaluations for a certain subset of its suppliers. Although it is neither feasible nor appropriate for IBM to evaluate all of its thousands of suppliers, the company does so for certain production-related suppliers, based upon the degree of environmental risk inherent in their operations and the extent to which their work is unique to IBM. The objective of these evaluations is to assess whether the suppliers have a good focus on environmental management, including complying with laws and regulations and through sound management practices.

As an example, IBM evaluates all of its hazardous waste disposal vendors, their facilities and treatment methods, prior to approving them for use. Vendors are periodically reevaluated in order to verify that their environmental operations remain satisfactory.

4.6 Objective 6 Determine if and how IBM uses progress towards targets to continually improve the environment

The facility measures its performance against established objectives and targets in various ways, depending on the specific objectives and targets. Progress towards achieving the facility's established targets is reviewed periodically. This review is either done monthly, quarterly, or at some other frequency established by the facility personnel who are responsible for meeting that objective and target. These reviews may take the form of a report to Corporate Environmental Affairs, site management or review by other responsible personnel. Whichever mechanism is used, the individual responsible for achieving the target is also responsible for ensuring that the target is met within the identified time frame.

4.7 Objective 7 Determine if IBM's EMS leads to greater employee awareness of their impact on the environment as well as the likelihood that they will make adjustments to reduce their impact.

During modification of IBM's existing EMS to meet all of the requirements of the ISO 14001 standard, several areas were noted that improved the performance of the site. Specific to employee awareness, improvement was noted by of IBM representatives with respect to the awareness site personnel have of the site environmental requirements program and performance. This begins the process of integrating ownership of environmental performance into the day-to-day business practices of all site employees. Employee awareness is measured primarily through annual internal peer audits of the site's EMS.

5.0 Findings

Through the use of operational controls IBM ensures that activities with legal requirements or significant impacts are managed appropriately. The EMS has helped

IBM establish a formal mechanism for updating its procedures for operations and activities.

The EMS has added two key elements to IBM's training program. First the EMS has helped link job performance with a written environmental policy as well as the potential environmental consequences of not performing job duties appropriately. Second, measuring training effectiveness is integrated with the audit, review and corrective action processes. In this way, training is part of IBM's continual improvement cycle.

By incorporating its emergency preparedness program into the EMS, IBM has been able to increase employee and management awareness of the program, its importance, and their role in its successful implementation. The incorporation has also formalized review, document control, and continual improvement of the program.

IBM's compliance assurance system has evolved over many years and is now integrated in the company's EMS. IBM's program uses system protocols like audits, reporting, management review and corrective action to continually improve their compliance program.

As IBM's EMS was modified to meet the requirements of the ISO 14001 standard, and information was made available on aspects, impacts, etc. to site personnel. As a result, IBM has indicated that improvement was noted in the awareness of site personnel with respect to site environmental requirements and performance. This begins the process of integrating ownership of environmental performance into the day-to-day business practices of all site employees.

IBM has maintained and developed a broad spectrum of EMS elements for over 25 years. Pollution prevention continues to be an important element in its EMS and certification of its EMS to ISO 14001 did not affect existing ongoing pollution prevention activities. However, the ISO 14001 EMS did provide additional structure and increased awareness of existing ongoing pollution prevention activities.

IBM shares appropriate technology and expertise with many of its suppliers. This not only ensures that its products are produced in an environmentally responsible manner, but also assists suppliers in improving their own environmental performance

5.1 Objective 1 Environmental Protection

Because of IBM's long history of adopting measures to improve its environmental performance, there were no major environmental improvements in the operation but, rather increments of improvement. There have however been improvements in other areas that can substantially be attributed to the implementation of the ISO 14001 EMS.

- Improvement was noted in the awareness site personnel have of site environmental requirements program and performance. This continues the

process of integrating ownership of environmental performance into the day-to-day business practices of all site employees

- IBM's Environmental Policy expresses a commitment to the protection of its employees, the communities in which they work, and the global environment. IBM's decision to have all of its facilities ISO 14001 certified under one registration is reflected in this corporate policy
- The non-regulated nature of IBM's aspects indicates IBM's belief that regulated aspects are under control and additional benefits are limited and that progress in environmental protection lies outside of the regulatory arena
- Calibrations of devices monitoring and measuring EMS characteristics were always performed. Incorporation of the calibration process into a more structured program similar to the Site ISO 9001 (quality management and quality assurance standards) process improved control of the critical devices. It allowed IBM to more clearly differentiate between devices which require calibration versus those which only require verification that they are functional (e.g., leak detectors which either work or don't work and do not require calibration)
- Operating procedures existed for most on-site EMS-related processes (wastewater treatment plant, Chemical Distribution Center, waste handling, powerhouse, etc.). IBM states that the document control process required by ISO 14001 added value to their system. IBM states this resulted in the identification of procedures required to control document changes and for ensuring personnel are informed of changes
- Records - improvement was noted by IBM personnel in the process of identifying the environmental records, their specific owner and location

5.2 Objective 2 Environmental Information

- IBM provides the public with corporate-wide information about its facilities through its web site, annual report, and its public relations department. The amount of information provided has not increased since the adoption of their EMS
- The San Jose site does believe that their EMS has lent additional credibility to the site and its activities, strengthened its working relationships with community and agency representatives, and supports their efforts to be viewed as an environmental leader

5.3 Objective 3 Economic Incentives and Barriers to EMS Implementation

Economic data was not provided by IBM for the establishment of their ISO 14001 registration.

5.4 Objective 4 Identify other Challenges to Successful EMS Implementation

A challenge identified by IBM in establishing its ISO 14001 EMS was assuring that processes required for maintenance of the EMS registration were designed with minimal complexity to assure efficient implementation.

5.5 Objective 5 Determine if and how IBM's EMS affects customers and suppliers

IBM helps to ensure that the Environmental Policy objectives are met by their suppliers through substantive environmental evaluations for a certain subset of its suppliers. Although it is neither feasible nor appropriate for IBM to evaluate all of its thousands of suppliers, the company does so for certain production-related suppliers, based upon the degree of environmental risk inherent in their operations and the extent to which their work is unique to IBM. The objective of these evaluations is to assess whether the suppliers have a good focus on environmental management, including complying with laws and regulations and through sound management practices.

Product design standards, as applicable, are provided to suppliers to help assure that facility products are designed and manufactured so that they incorporate relevant environmental considerations. Similarly, the facility's ISO 14001 EMS has helped assure its customers that the facility establishes and meets the highest standards of environmental care.

5.6 Objective 6 Determine if and how IBM uses progress towards targets to continually improve environmental protection

Improvement was noted by IBM representatives with respect to the awareness site personnel have of the environmental requirements program and performance.

5.7 Objective 7 Determine if IBM's EMS leads to greater employee awareness of their impact on the environment as well as the likelihood that they will make adjustments to reduce their impact

For many years IBM has provided training to its employees on the potential impact associated with their respective job responsibilities. Following implementation of the ISO 14001 EMS, employees continued to receive the same type of training. In addition, they receive annual ISO 14001 EMS awareness training. The awareness training tied the job responsibility training more directly to the site EMS. This type of training continues the process of integrating ownership of environmental performance into the day-to-day business practices of all site employees.

6.0 Conclusions of the IBM Pilot Project

Because IBM has such a long history of being an environmental steward and was ISO 9001 and 14001 certified when it became a pilot project, the Project Manager did not see dramatic changes in its environmental performance. However, based on observations and information received from IBM, key benefits from ISO registration appear to be:

1. The company's effort to encourage its suppliers to establish and/or align their respective EMSs with the requirements of ISO 14001 and to pursue registration;
2. The awareness site personnel have of the site environmental requirements program and performance; and
3. Improved documentation and maintenance of up-to-date operating procedures.

IBM has a mature and sophisticated EMS that appears to have contributed to environmental protection beyond the limits established by legislation. This is supported by:

1. Good compliance record and programs that support compliance;
2. A system of environmental management that goes beyond legal requirements and manages, through operational controls, all significant environmental aspects including those which are not regulated;
3. Objectives and targets in mostly unregulated areas that facilitate continual improvement;
4. Clear and articulate policies for environmental management;
5. Employee involvement and understanding of environmental responsibilities;
6. Commitment to communities in which IBM operates; and
7. Encouraging better environmental protection from suppliers through technical assistance and innovative contracts.

Table 1. Significant Aspects and Impacts for IBM

Note for Table 1:

* Health & Safety is outside the scope of ISO14001 and our certified EMS, therefore impacts are not considered as part of our EMS analysis.

Aspect	Regulated Impacts				Non-Regulated Impacts					
	Air	Water	Haz. Material or Waste	Health & Safety* (other)	Air	Water	Solid Waste	Energy	Material/ Resource Input	Other
Energy Use	--	--	--	--	--	--	--	X	X	--
Solid Waste	--	--	--	--	--	--	X	--	--	--
Water Use	--	--	--	--	--	X	--	--	X	--
Transportation (employee)	--	--	--	--	X	--	--	--	--	X (non-regulated)
Products	--	--	--	--	--	--	--	--	X	X (regulated)
Water Discharges	--	X	--	--	--	--	--	--	--	--
Hazardous/ Regulated Waste Discharges	--	--	X	--	--	--	--	--	--	--
Unplanned Releases	X	X	X	--	--	--	--	--	--	--
Air Emissions	X	--	--	--	--	--	--	--	--	--
Chemical Use	--	--	X	--	--	--	--	--	X	--
Groundwater/Soil Cleanup	X (tracked under Air Emissions)	X	--	--	--	X	--	--	--	--
Transportation (hazardous materials)	--	--	X	--	--	--	--	--	--	--

Table 2. Objectives and Targets for IBM

Objective	Target	Status	Regulated		Non-Regulated
			Meets	Beyond	
Reduce power consumption	Conserve 4% energy use (1997)	Achieved	N/A	N/A	X
Reduce waste generation	Recycle 85% of waste (1997)	Not Achieved	N/A	N/A	X
Reuse materials where possible	Recycle 85% of waste (1997)	Not Achieved	N/A	N/A	X
Recycle materials	Recycle 85% of waste (1997)	Not Achieved	N/A	N/A	X
Purchase recycled items	Recycle 85% of waste (1997)	Not Achieved	N/A	N/A	X
Efficient water use	Generate trend charts (1997)	Achieved	N/A	N/A	X
Reduce hazardous waste generation	Reduce off-site disposal year-to-year indexed to production (1997)	Achieved	N/A	N/A	X
Conform to ISO 14001 standard	ISO registration (1997)	Achieved	N/A	N/A	X

Table 3. Pilot Project Environmental Performance Measures for IBM

Notes for Table 3:

* Data supplied is IBM worldwide electricity use value and NOT IBM San Jose energy use.

** The primary solid waste material recycled is metal. The majority of this recycle stream is not directly related to the manufacturing process and is, therefore, not tied to normalized production. The source of the metals is primarily related to returned equipment teardown and facilities rearrangement activities.

Indicator	Baseline Data						Update Data			
	Year 1 (1994)		Year 2 (1995)		Year 3 (1996)		1997		2000	
	Non-Normalized	Normalized	Non-Normalized	Normalized	Non-Normalized	Normalized	Non-Normalized	Normalized	Non-Normalized	Normalized
Energy Use*	7,067,000,000 kWhr	N/A	6,412,000,000 kWhr	N/A	6,187,000,000 kWhr	N/A	5,820,000,000 kWhr	N/A	Not available	N/A
Solid Waste % Recycle**	84	N/A	81	N/A	76	N/A	71.3	N/A	80.6	N/A
Hazardous Waste Disposal	1,704 tons	46.1 tons per million units produced	1,648 tons	23.2 tons per million units produced	2,158 tons	29.5 tons per million units produced	1,979 tons	16.2 tons per million units produced	1,877 tons	18.6 tons per million units produced
Total TRI Emissions	0.45 Million lbs	0.01 million lbs per million units produced	1.3 million lbs	0.02 million lbs per million units produced	1.75 million lbs	0.02 million lbs per million units produced	2.7 million lbs	0.02 million lbs per million units produced	1.0 million lbs	0.01 million lbs per million units produced
Total TRI Air Emissions	409 lbs	11 lbs per million units produced	7,210 lbs	114 lbs per million units produced	6,870 lbs	94 lbs per million units produced	4,500 lbs	36.9 lbs per million units produced	4,000 lbs	39.6 lbs per million units produced
Wastewater Discharge	207,000,000 gal.	5.6 million gal per million units produced	213,000,000 gal.	3.4 million gal per million units produced	203,000,000 gal.	2.8 million gal per million units produced	197,800,000 gal	1.62 million gal per million units produced	218,550,000 gal	2.16 million gal per million units produced
Water Use	139,000,000 gal.	3.8 million gal per million units produced	149,000,000 gal.	2.4 million gal per million units produced	145,000,000 gal.	2.0 million gal per million units produced	153,000,000 gal	1.25 million gal per million units produced	138,700,000 gal	1.37 million gal per million units produced

Table 4. Environmental Performance Compared to Regulatory Requirements for IBM

Notes for Table 4:

- (1) NOx, SOx, CO and particulate limits are established for site boilers and 50MW emergency generator. Limits are highly variable based on the specific permitted device and are based on emission concentration, or hours of operation, gal/hr of fuel use and/or concentration of sulfur in the burned fuel. There is no simple mechanism to report these details in the requested format.
- (2) VOC limits are established by specific individual source. IBM San Jose has approximately 100 individual sources, most with different emission limits (e.g., lbs/day, lbs/yr, gallons of VOC used, etc.). The amount of data required to be reported is too extensive for the format requested.
- (3) Industrial wastewater discharge limits are expressed in terms of monthly average concentration for Federal limits.
- (4) TTO Federal limit is based on Daily Maximum.
- (5) Local limit is based on maximum concentration in any sample.
- (6) Emission level data is reported as the monthly average concentration. Analytical results determined to be less than the analytical detection limit were averaged as one-half the detection limit.

Regulatory Requirement			Objective and Target	Environmental Performance Measure				
Permitted Emission	Regulation	Permit limit		1994	1995	1996	1997	2000
NOx	Local air requirement	(1)	None - under Operational Control	9.6 t/yr	8.5 t/yr	9.6 t/yr	4.5 t/yr	9.4 t/yr
SOx	Local air requirement	(1)	None - under Operational Control	2.0 t/yr	1.5 t/yr	2.0 t/yr	7.7 t/yr	2.0 t/yr
CO	Local air requirement	(1)	None - under Operational Control	6.3 t/yr	4.1 t/yr	9.6 t/yr	1.4 t/yr	10.9 t/yr
Particulates	Local air requirement	(1)	None - under Operational Control	1.4 t/yr	1.0 t/yr	1.5 t/yr	0.9 t/yr	1.5 t/yr
VOCs	Local air requirement	(2)	None - under Operational Control	29.4 t/yr	28.0 t/yr	36.0 t/yr	21.6 t/yr	20.9 t/yr
Solid Waste	N/A	N/A	Varies by Year	N/A	N/A	N/A	N/A	N/A
Hazardous Waste	RCRA	N/A	Varies by Year	N/A	N/A	N/A	N/A	N/A
Ethylene Glycol (total TRI)	SARA	N/A	None - under Operational Control	447,351 lbs	590,140 lbs	880,671 lbs	1,595,160 lbs	58,400 lbs
Hydrochloric Acid (total TRI)	SARA	N/A	None - under Operational Control	768 lbs	Not Reportable	Not Reportable	Not Reportable	Not Reportable
N-methyl-2-pyrrolidone (total TRI)	SARA	N/A	None - under Operational Control	Not Reportable	709,644 lbs	869,666 lbs	1,106,400 lbs	918,500 lbs
Nitrate Compounds (total TRI)	SARA	N/A	None - under Operational Control	Not Reportable	Not Reportable	Not Reportable	Not Reportable	55,400 lbs

Regulatory Requirement			Objective and Target	Environmental Performance Measure				
Permitted Emission	Regulation	Permit limit		1994	1995	1996	1997	2000
Ethylene Glycol (total air TRI)	SARA	N/A	None - under Operational Control	107 lbs	110 lbs	170 lbs	160 lbs	10 lbs
Hydrochloric Acid (total air TRI)	SARA	N/A	None - under Operational Control	302 lbs	Not Reportable	Not Reportable	Not Reportable	Not Reportable
N-methyl-2-pyrrolidone (total air TRI)	SARA	N/A	None - under Operational Control	Not Reportable	7,100 lbs	6,700 lbs	4,300 lbs	4,000 lbs
Nitrate Compounds (total air TRI)	SARA	N/A	None - under Operational Control	Not Reportable	Not Reportable	Not Reportable	Not Reportable	0 lbs
Cadmium	Clean Water Act (Fed. or State)	0.12 mg/l	None - under Operational Control	0.005 mg/l	0.005 mg/l	0.003 mg/l	0.005 mg/l	<0.005 mg/l (limit >1997: 0.15 mg/l)
Chromium	Clean Water Act (Fed. Or State)	0.79 mg/l	None - under Operational Control	0.02 mg/l	0.02 mg/l	0.01 mg/l	0.02 mg/l	0.005 mg/l (limit >1997: 0.97 mg/l)
Copper	Clean Water Act (Fed. Or State)	0.95 mg/l	None - under Operational Control	0.04 mg/l	0.03 mg/l	0.02 mg/l	0.066 mg/l	0.01 mg/l (limit >1997: 1.18 mg/l)
Cyanide (Total)	Clean Water Act (Fed. Or State)	0.30 mg/l	None - under Operational Control	0.03 mg/l	0.03 mg/l	0.008 mg/l	0.03 mg/l	<0.05 mg/l (no limit for 2000)
Mfg. #1 CN	Clean Water Act (Fed. Or State)	0.65 mg/l	None - under Operational Control	N/A	0.03 mg/l	0.01 mg/l	0.20 mg/l	<0.05 mg/l
Mfg. #2 CN	Clean Water Act (Fed. Or State)	0.65 mg/l	None - under Operational Control	N/A	0.14 mg/l	0.02 mg/l	No longer exists	No longer exists
Lead	Clean Water Act (Fed. Or State)	0.20 mg/l	None - under Operational Control	0.04 mg/l	0.03 mg/l	0.03 mg/l	0.03 mg/l	<0.05 mg/l (limit >1997: 0.25 mg/l)
Nickel	Clean Water Act (Fed. Or State)	1.09 mg/l	None - under Operational Control	0.10 mg/l	0.05 mg/l	0.01 mg/l	0.048 mg/l	0.016 mg/l (limit >1997: 1.36 mg/l)
pH	Clean Water Act (Fed. Or State)	>5.0	None - under Operational Control	7.7 - 9.1	7.2 - 8.8	7.2 - 9.5	7.3 - 9.0	2.1 - 8.2

Regulatory Requirement			Objective and Target	Environmental Performance Measure				
Permitted Emission	Regulation	Permit limit		1994	1995	1996	1997	2000
Silver	Clean Water Act (Fed. Or State)	0.11 mg/l	None - under Operational Control	0.005 mg/l	0.005 mg/l	0.005 mg/l	0.005 mg/l	<0.02 mg/l (limit >1997: 0.14 mg/l)
Total Toxic Organics	Clean Water Act (Fed. Or State)	0.98 (4)	None - under Operational Control	0.03 mg/l	0.05 mg/l	0.03 mg/l	0.12 mg/l	<0.01 mg/l (limit >1997: 1.21 mg/l)
Zinc	Clean Water Act. (Fed. Or State)	0.68 mg/l	None - under Operational Control	0.05 mg/l	0.05 mg/l	0.04 mg/l	0.09 mg/l	0.27 mg/l (limit >1997: 0.84 mg/l)
Cadmium (5)(6)	Local pretreatment program requirement	0.7 mg/l	None - under Operational Control	0.005 mg/l	0.005 mg/l	0.003 mg/l	0.005 mg/l	<0.005 mg/l
Chromium (5)(6)	Local pretreatment program requirement	1.0 mg/l	None - under Operational Control	0.02 mg/2	0.02 mg/l	0.01 mg/l	0.02 mg/l	0.005 mg/l
Copper (5)(6)	Local pretreatment program requirement	2.7 mg/l	None - under Operational Control	0.04 mg/l	0.03 mg/l	0.02 mg/l	0.066 mg/l	0.01 mg/l (limit >1997: 0.05 mg/l)
Cyanide (total) (5)(6)	Local pretreatment program requirement	1.0 mg/l	None - under Operational Control	0.03 mg/l	0.03 mg/l	0.008 mg/l	0.03 mg/l	<0.05 mg/l
Lead(5)(6)	Local pretreatment program requirement	0.4 mg/l	None - under Operational Control	0.03 mg/l	0.03 mg/l	0.04 mg/l	0.03 mg/l	<0.05 mg/l
Nickel (5)(6)	Local pretreatment program requirement	2.6 mg/l	None - under Operational Control	0.10 mg/l	0.05 mg/l	0.01 mg/l	0.048 mg/l	0.016 mg/l (limit >1997: 0.10 mg/l)
pH (5)(6)	Local pretreatment program requirement	5.0 - 10.5	None - under Operational Control	7.7 - 9.1	7.2 - 8.8	7.2 - 9.5	7.3 - 9.0	2.1 - 8.2 (limit >1997: 6.0 - 12.5)

Regulatory Requirement			Objective and Target	Environmental Performance Measure				
Permitted Emission	Regulation	Permit limit		1994	1995	1996	1997	2000
Silver (5)(6)	Local pretreatment program requirement	0.7 mg/l	None - under Operational Control	0.005 mg/l	0.005 mg/l	0.005 mg/l	0.005 mg/l	<0.02 mg/l
Zinc (5)(6)	Local pretreatment program requirement	2.6 mg/l	None - under Operational Control	0.05 mg/l	0.05 mg/l	0.04 mg/l	0.09 mg/l	0.27 mg/l

Table 5. Compliance Information for IBM

Infraction	Historic	Baseline			Update	
		Year 1994	Year 1995	Year 1996	Year 1997	Year 2000
Major Violation	N/A	0	0	0	0	0
Significant (Moderate) Violation	N/A	0	0	0	0	0
Minor Violation	N/A	0	0	2-No Penalty	0	1-No Penalty
Noncompliance	N/A	1	0	1	0	0
Potential Noncompliance	N/A	0	0	0	0	0

Note: Most EPA enforcement policies explicitly utilize "Major, significant (moderate) and minor" classifications to determine the appropriate enforcement response to a given violation. A Noncompliance is an infraction either discovered by the regulated party or environmental agency that does not lead to a violation. A Potential Noncompliance is a situation that is discovered and corrected before a violation could occur.

Table 6. Environmental Information Type and Availability to Public

Information Subject	Legal Requirement		Location of Public Information					
	Yes	No	Web site	Public Relations Dept.	Newsletter	Annual Report	Environmental Agency	Other
EMS Policy		X	X-Corporate (www.ibm.com/environment/)	--	--	X-Corporate (hard copy + online)	X-CalEPA	--
EMS Env. Aspects		X	--	--	--	--	X-CalEPA	--
EMS Env. Impacts		X	--	--	--	--	X-CalEPA	--
EMS Objectives and Targets		X	--	--	--	--	X-CalEPA	--
Operation and Procedures		X	--	--	--	--	--	--
Compliance information	X		(see Annual Report)	--	--	X-Corporate summary (hard copy + online)	X	--
Hazardous waste generation	X		(see Annual Report)	--	--	X-Corporate summary (hard copy + online)	X	--
Air emissions	X		(see Annual Report)	--	--	X-Corporate summary (hard copy + online)	X	--
Water discharge	X		(see Annual Report)	--	--	X-Corporate summary (hard copy + online)	X	--
Resource use: energy		X	(see Annual Report)	--	--	X-Corporate summary (hard copy + online)	X-CalEPA (Corporate use)	--
Resource use: water		X	(see Annual Report)	--	--	X-Corporate summary (hard copy + online)	X-CalEPA	--
Resource use: materials		X	--	--	--	--	--	--
Solid Waste		X	(see Annual Report)	--	--	X-Corporate summary (hard copy + online)	X-CalEPA	--

Information Subject	Legal Requirement		Location of Public Information					
	Yes	No	Web site	Public Relations Dept.	Newsletter	Annual Report	Environmental Agency	Other
TRI	X		(see Annual Report)	--	--	X-Corporate summary (hard copy + online)	X	--
Community Right to Know	X		--	--	--	--	X, as required	--
Prop. 65	X		--	--	--	--	--	Specific postings, as required
Other		X	(see Annual Report)	--	--	X-Corporate summary (hard copy + online)	--	--

Note: For Legal Reporting Requirement, mark NA if not applicable